2.3.7. Range and Bearing Accuracy

2.3.7.1. Purpose

The purpose of this test is to determine how accurately the radar can determine the target's range and bearing and to qualitatively evaluate the effects this accuracy has upon mission relatable intercepts and attacks.

2.3.7.2. General

An accurate measurement of radar range and bearing accuracy requires an outside source of space positioning information for both the target and the test airplane. Additionally, a precise determination of range and bearing accuracy can be important for two reasons. First, the radar derived range is used in several of the other test techniques. Any errors in radar range can thus contribute to errors in other test data. Second, when used for poor weather join-ups for VID and for tanking, the pilot needs to know radar ranges accurately in order to execute a safe intercept. For these reasons, strong consideration should be given to the use of accurate space positioning truth data in this test.

A rough check of range and bearing accuracy without space positioning data is available in cases where the more accurate test is not required. As with all the other tests, the critical factor is the utility of the parameters in a mission relatable scenario. If the range and bearing accuracy is qualitatively evaluated to be sufficient in this environment, the rough numbers that this procedure will obtain are sometimes sufficient. If it fails, a more expensive test will be required; however, this test can still be used to gain some insight to support the qualitative assessment. All that is required for the test is that both the test and target aircraft be Tactical Air Navigation (TACAN) equipped. However, if the target is equipped with a radar of known good range and bearing accuracy it can be used to refine the measurements. Care should be taken such that the test and target aircraft radars are sufficiently separated in frequency to prevent casual interference with the test system.

Since we are concerned with the range and bearing information available to the operator, the format and quality of the radar display can have a significant influence upon the accuracies. During STT the radar often provides a digital display of the range and bearing which eliminates the errors associated with reading the radar display's graphical scales. Often the range and bearing to a cursor is available in the search mode. If a cursor is available in the search mode it should be used for the test since it will increase the range and bearing display accuracy over an estimate using the display scale.

The accuracy should be tested in both the search and STT modes. The results are often different. The smallest range scale that still displays the target should be used when reading bearing and ranges from the scales without the aid of digital readouts since the smaller scale will allow for more accurate reading. The range and bearing accuracies should be qualitatively evaluated during mission relatable intercepts and attacks to assess the utility of the information supplied to the operator for the accomplishment of the mission.

2.3.7.3. Instrumentation

Data cards with an optional voice recorder will be required for this test. If a target with a previously tested radar is available, it should be used.

2.3.7.4 Data Required

Record the TACAN position of both the target and test airplane and the radar derived range and bearing to the target. If the target is radar equipped, record the target and test airplane derived bearing and ranges to each other. During mission relatable intercepts and attacks, record qualitative comments concerning the effects of the accuracy of the range and bearing information supplied to the operator.

2.3.7.5. Procedure

For a target airplane without a radar, place the target and test airplanes on the same radial from a prebriefed TACAN station at 30 to 40 nm separation. Fly the target and test airplanes on headings necessary to maintain the same radial from the TACAN station with the target 1,000 feet above the test airplane. The airplanes should be heading towards each other. Establish radar contact with the target in search mode. On a mark given by the test airplane, the test airplane should record the radar derived bearing and range to the target and the TACAN bearing and range. Simultaneously, the

target should record its TACAN bearing and range. Establish an STT and repeat the procedure. If the target has a radar, have the target establish an STT on the test airplane and also record the range and bearing to the test airplane at the same time that the TACAN position is recorded.

2.3.7.6. Data Analysis and Presentation

Since both airplanes are on the same TACAN radial, the bearing to the target is the radial or its reciprocal. This bearing should be compared to the radar derived bearing. The TACAN derived radial within the two aircraft is designed to have an accuracy of 3° to 4° and so the truth data will have the same accuracy given that both pilots fly the same indicated radial. [Ref. 38:p, 2.74].

The TACAN derived Distance Measuring Equipment (DME) mileages can be subtracted to gain the range to the target and then compared to the radar derived range. The TACAN derived range truth data will have approximately 0.5 nm of accuracy [Ref. 38:p. 2.74]. If a radar equipped target is used that has had full radar range and bearing accuracy tests performed, the reciprocal bearing and the radar derived range can be used as the truth data with an accuracy equal to the tested accuracy of the target airplane's radar.

During mission relatable intercepts and attacks, the radar derived range and bearing information should be evaluated for their utility in affecting the intercept and for the effects that the largest measured error will have upon weapons acquisition and accuracy. The effects upon tactics should then be related.

2.3.7.6. Data Cards

A sample data card is provided as card 11.

CARD NUMBER ___ TIME PRIORITY L/M/H

AIR-TO-AIR RANGE AND BEARING ACCURACY

[POSITION THE TARGET AND THE TEST AIRPLANE ON THE ___ RADIAL OF THE ___CHANNEL TACAN HEADING TOWARDS EACH OTHER. VARY THE HEADINGS SLIGHTLY TO MAINTAIN THE RADIAL WITH THE TARGET 1,000 FEET ABOVE THE TEST AIRPLANE. ESTABLISH RADAR CONTACT IN SEARCH MODE IN THE TEST AIRPLANE AND WITH STT IN THE TARGET AIRPLANE. ON THE TEST AIRPLANE'S CALL, BOTH AIRCRAFT RECORD TACAN BEARING/RANGE AND RADAR DERIVED BEARING/RANGE TO EACH OTHER. REPEAT WITH THE TEST AIRPLANE IN STT.]

TARGET TACAN BEARING/RANGE	TEST TACAN BEARING/RANGE	TARGET RADAR BEARING/RANGE	TEST RADAR BEARING/RANGE

[EVALUATE RADAR BEARING AND RANGE QUALITATIVELY DURING MISSION RELATABLE INTERCEPTS AND ATTACKS.]

TACTIC:

EFFECTS:

Card 11: Air-to-Air Range And Bearing Accuracy Data Card